

2010 Monitoring Summary



Pepperell Branch upstream of Sougahatchee Creek behind Opelika Westside WWTP in Lee County (32.66030/-85.44870)

BACKGROUND

Pepperell Branch, from Sougahatchee Creek to its source, was placed on Alabama's 1998 Clean Water Act (CWA) §303(d) list of impaired waters for not meeting its *Fish & Wildlife (F&W)* water use classification. It was listed for nutrients and pathogens from industrial and municipal sources. During 2010, ADEM monitored Pepperell Branch at PPLL-5 to collect data to develop nutrient and pathogen Total Maximum Daily Loads (TMDLs).



Figure 1. Pepperell Branch at PPLL-5, May 25, 2010.

WATERSHED CHARACTERISTICS

The Pepperell Branch watershed at PPLL-5 is located within the Southern Outer Piedmont Ecoregion (45b) in Lee County. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily development (48%) and forest (40%; Table 1). As of June 6, 2013, a total of eighty eight NPDES permits have been issued within the watershed.

REACH CHARACTERISTICS

General observations (Table 2) and a habitat assessment (Table 3) were completed during the macroinvertebrate assessment. In comparison with reference reaches in the same ecoregion, they give an indication of the physical condition of the site and the quality and availability of habitat. Pepperell Branch at PPLL-5 is a sandy-bottomed, mostly-shaded stream reach (Figure 1). Overall habitat quality was categorized as *marginal*.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Tallapoosa River	
Drainage Area (mi²)	15	
Ecoregion^a	45b	
% Landuse		
Open water		1
Wetland	Woody	1
Forest	Deciduous	22
	Evergreen	16
	Mixed	2
Shrub/scrub		1
Grassland/herbaceous		3
Pasture/hay		6
Cultivated crops		<1
Development	Open space	15
	Low intensity	24
	Moderate intensity	6
	High intensity	3
Barren		<1
Population/km^{2b}	392	
# NPDES Permits^c	TOTAL	88
Construction Stormwater		76
Industrial General		4
Industrial Individual		3
Municipal Individual		2
Underground Injection Control		3

a.Southern Outer Piedmont

b.2000 US Census

c.#NPDES permits downloaded from ADEM's NPDES Management System database, June 6, 2013.

Table 2. Physical characteristics of Pepperell Branch at PPLL-5, June 22, 2010.

Physical Characteristics		
Width (ft)	16	
Canopy Cover	Mostly Shaded	
Depth (Ft)		
	Run	1.2
	Pool	2.0
% of Reach		
	Run	70
	Pool	30
% Substrate		
	Boulder	1
	Clay	1
	Cobble	8
	Gravel	5
	Sand	70
	Silt	7
	Organic Matter	8

Table 3. Results of the habitat assessment conducted on Pepperell Branch at PPLL-5, June 22, 2010.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	44	Marginal (41-58)
Sediment Deposition	71	Sub-optimal (55-79)
Sinuosity	55	Marginal (45-64)
Bank and Vegetative Stability	54	Marginal (35-59)
Riparian Buffer	71	Sub-optimal (70-89)
Habitat Assessment Score	124	
% Maximum Score	56	Marginal (41-58)

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). The WMB-I uses measures of taxonomic richness, community composition, and community tolerance to assess the overall health of the macroinvertebrate community. Each metric is scored on a 100 point scale in comparison to least-impaired reference reaches in the same ecoregion. The final score is the average of all individual metric scores. Metric results indicated the macroinvertebrate community to be in *poor* condition (Table 4).

Table 4. Results of the macroinvertebrate bioassessment conducted in Pepperell Branch at PPLL-5, June 22, 2010.

Macroinvertebrate Assessment		
	Results	Scores
Taxa richness and diversity measures		(0-100)
# EPT taxa	9	22
Shannon Diversity	3.66	45
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	14	30
% Non-insect taxa	6	83
Tolerance measures		
% Tolerant taxa	43	15
WMB-I Assessment Score	---	39
WMB-I Assessment Rating		Poor (23-46)

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly during April through November, 2010 to help identify any stressors in the biological communities. Five in situ measurements and *E. coli* samples were collected in June and in August to determine if instream pathogen concentrations met all *F&W* criteria. The first sample collected each month was used to calculate the values presented in Table 5.

In August, the *E. coli* bacteria count exceeded the *F&W* criterion for single samples collected June through September. The geometric means of both June and September samples also exceeded the *F&W* criterion. Total nitrogen, nitrate+nitrite-nitrogen, and total Kjeldahl nitrogen were higher than expected for Piedmont streams, based on the 90th percentile of data from reference reaches in this ecoregion.

The median concentration of specific conductivity was over three times higher than the median concentration of all verified reference reach data collected in ecoregion 45. Alkalinity and chlorides were also higher than expected, based on the 90th percentile of ecoregional reference data.

Table 5. Summary of water quality data collected April-November, 2010. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). Median, average (Avg), and standard deviations (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value.

Parameter	N	Min	Max	Med	Avg	SD
Physical						
Temperature (°C)	8	16.8	27.8	23.8	23.1	4.0
Turbidity (NTU)	8	2.6	38.0	4.9	12.0	13.8
Total Dissolved Solids (mg/L)	8	32.0	102.0	72.0	69.5	22.4
Total Suspended Solids (mg/L)	8	< 1.0	10.0	3.0	3.4	3.0
Specific Conductance (µmhos)	8	90.5	161.5	144.6 ^G	130.2	28.8
Alkalinity (mg/L)	8	33.3	64.6	56.0 ^M	51.0	11.9
Stream Flow (cfs)	8	0.5	29.0	6.1	10.1	11.0
Chemical						
Dissolved Oxygen (mg/L)	8	6.9	8.9	7.8	7.9	0.8
pH (su)	8	6.8	7.6	7.1	7.1	0.3
Ammonia Nitrogen (mg/L)	8	< 0.021	< 0.021	0.010	0.010	0.000
Nitrate+Nitrite Nitrogen (mg/L)	8	0.131	0.457	0.322 ^M	0.290	0.113
Total Kjeldahl Nitrogen (mg/L)	8	< 0.080	0.422	0.350 ^M	0.275	0.155
Total Nitrogen (mg/L)	8	< 0.171	0.827	0.646 ^M	0.565	0.234
^J Dissolved Reactive Phosphorus (mg/L)	8	0.004	0.016	0.010	0.009	0.005
Total Phosphorus (mg/L)	8	0.010	0.043	0.021	0.022	0.010
^J CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0
Chlorides (mg/L)	8	3.8	8.3	5.6 ^M	5.9	1.8
Biological						
Chlorophyll a (ug/L)	8	< 0.53	3.20	1.20	1.36	0.97
^J <i>E. coli</i> (col/100mL)	19	66.3	2420	172	445	803

G=value> median of all verified ecoregional reference reach data collected in the ecoregion 45.; J-estimate; N=# samples; M=value > 90th percentile of all data collected within ecoregion 45.

SUMMARY

As part of the assessment process ADEM will review the monitoring information presented in this report, along with all other available data. Results of the 2010 bioassessment indicated the macroinvertebrate community in Pepperell Branch at PPLL-5 to be in *poor* condition, verifying impairment to biological communities. Habitat assessment information indicated the reach to be characterized by sediment deposition, bank erosion, limited riparian buffer areas, and a lack of stable instream substrates. Intensive water quality data identified specific conductance, alkalinity, chlorides, and nutrients as parameters of concern at this site.

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